SSNV217 - Cubic in simple tension and compression with model ENDO_ORTH_BETON

Summarized:

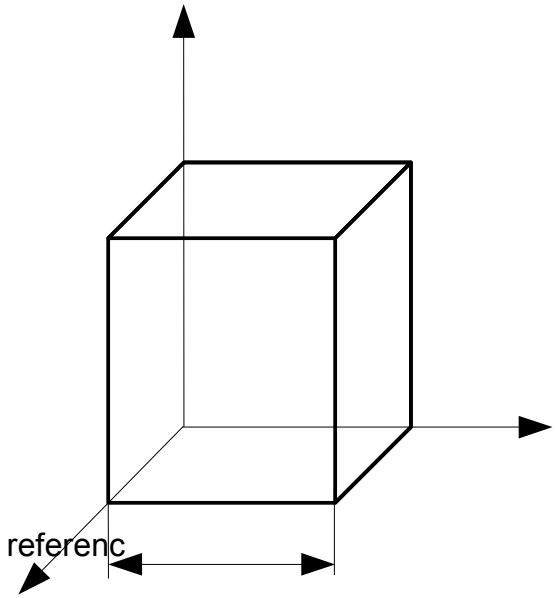
The modelization A of this test allows to test various possible configurations of damage of model ENDO_ORTH_BETON in four stages and to check the good management of the various mechanisms:

- progressive damage of tension in the direction X until it is blocked
- progressive damage of tension in the direction Y until it is blocked, in the presence of a blocked direction of damage (according to X)
- progressive damage of tension in the direction Z, in the presence of two blocked directions of damage (according to X and according to Y)
- phase of discharge then progressive damage of compression according to Z

The modelization B differs from the modelization A for the loading used during the various phases. Moreover, the modelization B adopts a nonlocal formalism by regularization of the deformation gradient.

1 Problem of XZGLADCBEHFYGéométrie

1.1



the cube is in space $[0.,1.]\times[0.,1.]\times[0.,1.]$.

Coordinates of the points (m) :

$A:(0.,0.,0.)$
$G:(1.,1.,1.)$

Geometry of the cube

$L=1\text{m}$

1.2 Properties of the isotropic

Elastic material:

$E=32\,GPa$: Young modulus
$\nu=0.2$: Poisson's ratio

Model ENDO_ORTH_BETON

$k_0=300\,Pa$; $k_1=10{,}5\,MPa$; $k_2=7\times10^{-4}$; $\alpha=0{,}9$; $\gamma_b=1000\,Pa$; $\gamma_d=60000\,Pa$

1.3 Boundary conditions and loadings

They consist into cubes displacements imposed on each side of the cube, and are expressed in meters.

1.4 Reference solution

This test is a test of non regression.

2 Modelization A

2.1 Characteristic of the modelization To

the modelization is 3D and uses model ENDO_ORTH_BETON.

2.2 Characteristics of the mesh

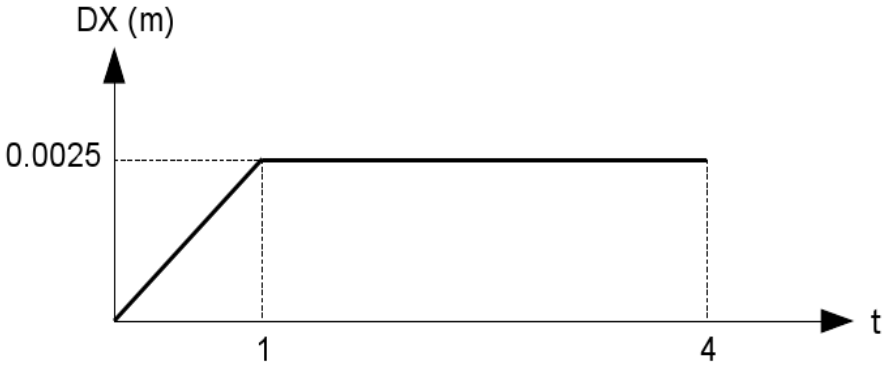
Many nodes: 8
Number of meshes and type: 1 HEXA8

2.3 Description of the loading

2.3.1 First stage: tension according to the axis X

- face $ADHE$: $DX=0$
- face $ABFE$: $DY=0$
- face $ABCD$: $DZ=0$
- face $DCGH$: $DY=0$
- face $EFGH$: $DZ=0$
- face $BCGF$: $DX=2{,}5\times10^{-3}$

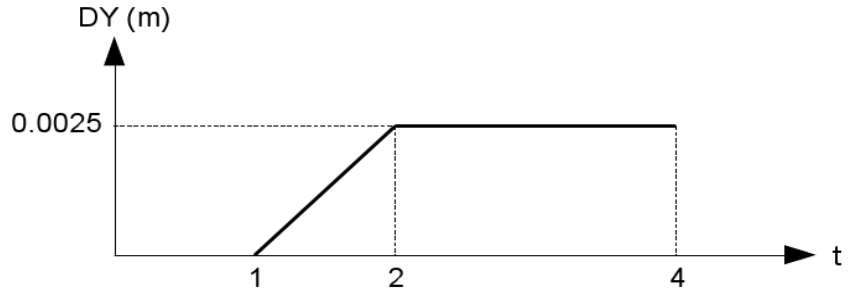
The displacement DX imposed on the face $BCGF$ varies gradually according to the function presented on the figure below. Once the maximum reached with $t=1\text{s}$, the displacement DX of the face $BCGF$ is then blocked for the following stages.



2.3.2 Second phase: tension according to the axis Y

- face $ADHE$: $DX=0$
- face $ABFE$: $DY=0$
- face $ABCD$: $DZ=0$
- face $BCGF$: $DX=0$
- face $DCGH$: $DY=2{,}5\times10^{-3}$

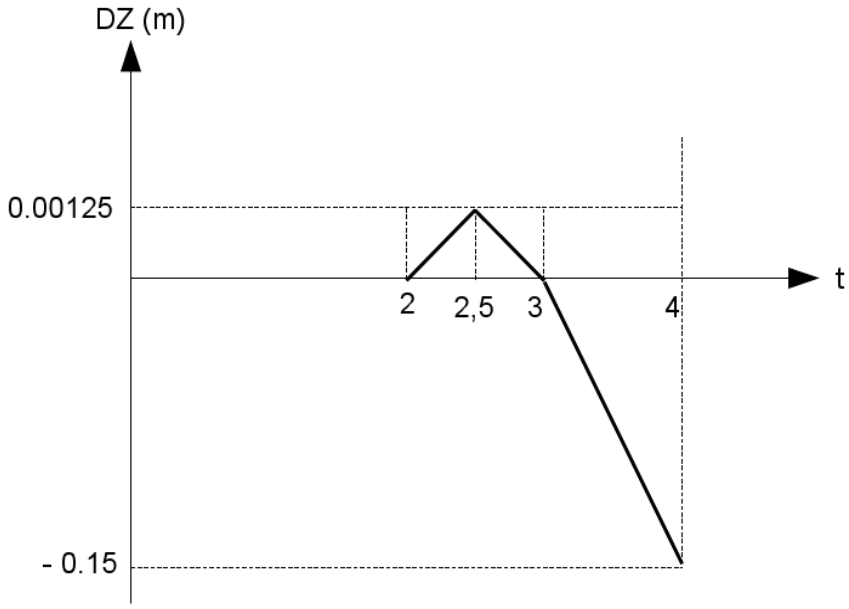
The displacement DY imposed on the face $DCGH$ varies gradually according to the function presented on the figure below. Once the maximum reached with $t=2\text{s}$, the displacement DY of the face $DCGH$ is then blocked for the following stages.



2.3.3 Third and fourth stage: charge, discharge and compression according to the axis Z

- face $ADHE$: $DX=0$
- face $ABFE$: $DY=0$
- face $ABCD$: $DZ=0$
- face $BCGF$: $DX=0$
- face $DCGH$: $DY=0$
- face $EFGH$: $DZ\neq 0$

The displacement DZ imposed on the face $EFGH$ varies gradually according to the function presented on the figure below:



2.4 Quantities tested and results

the results are read at the Gauss point n°1.

Quantity	Sequence number	Reference	Code_Aster	Tolerance (%)
$V1$	2	Non regression	0,86689832	0,1
$SIXX\,(Pa)$	10	Non regression	8888,8889	0,1

V2	12	Non regression	0,85897368	0,1
SIYY (*Pa*)	20	Non regression	8333,2067	0,1
V3	22	Non regression	0,8668983158	0,1
SIZZ (*Pa*)	25	Non regression	24072,93439241	0,1
V3	31	Non regression	0,8916168	0,1
SIZZ (*Pa*)	40	Non regression	−533333,3333	0,1

Table 2.4-1

3 Modelization B

3.1 Characteristic of the modelization B

The modelization is 3D and uses model ENDO_ORTH_BETON with a nonlocal formalism by regularization of the deformation gradient.

3.2 Characteristics of the mesh

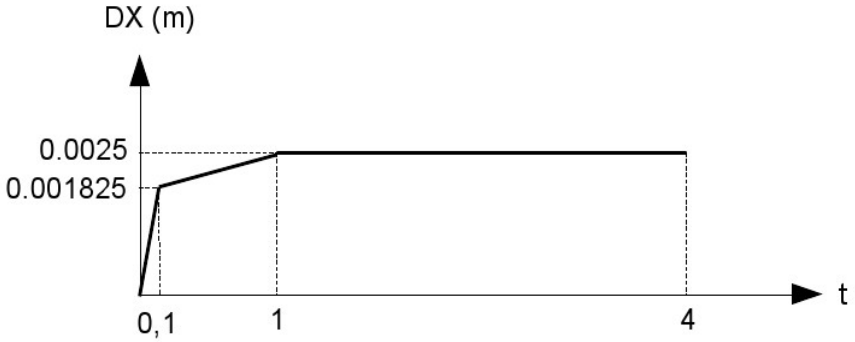
Many nodes: 8
Number of meshes and type: 1 HEXA8

3.3 Description of the loading

3.3.1 First stage: tension according to the axis X

- face $ADHE$: $DX=0$
- face $ABFE$: $DY=0$
- face $ABCD$: $DZ=0$
- face $BCGF$: $DX=2{,}5\times10^{-3}$

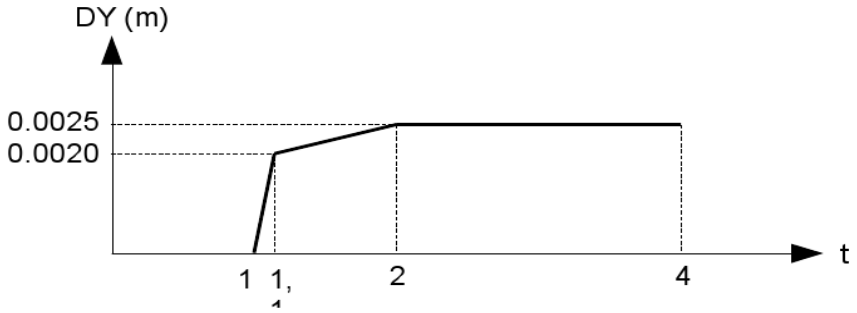
The displacement DX imposed on the face $BCGF$ varies gradually according to the function presented on the figure below. Once the maximum reached with $t=1\text{s}$, the displacement DX of the face $BCGF$ is then blocked for the following stages.



3.3.2 Second phase: tension according to the axis Y

- face $ADHE$: $DX=0$
- face $ABFE$: $DY=0$
- face $ABCD$: $DZ=0$
- face $BCGF$: $DX=0$
- face $DCGH$: $DY=2{,}5\times10^{-3}$

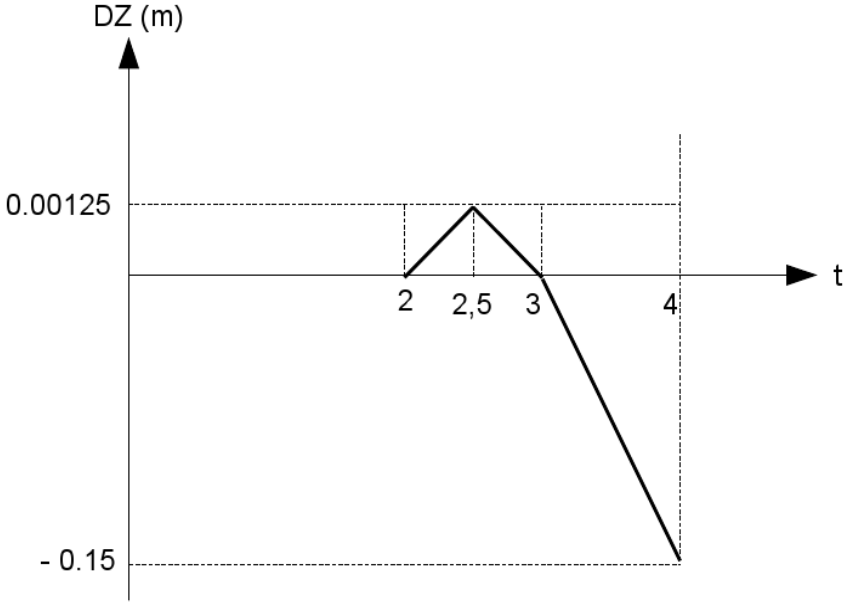
The displacement DY imposed on the face $DCGH$ varies gradually according to the function presented on the figure below. Once the maximum reached with $t=2\text{s}$, the displacement DY of the face $DCGH$ is then blocked for the following stages.



3.3.3 Third and fourth stage: charge, discharge and compression according to the axis Z

- face $ADHE$: $DX=0$
- face $ABFE$: $DY=0$
- face $ABCD$: $DZ=0$
- face $BCGF$: $DX=0$
- face $DCGH$: $DY=0$
- face $EFGH$: $DZ\neq 0$

The displacement DZ imposed on the face $EFGH$ varies gradually according to the function presented on the figure below:



3.4 Quantities tested and results

the results are read at the Gauss point n°1.

Quantity	Sequence number	Reference	Code_Aster	Tolerance (%)
$V1$	2	Non regression	0,9887038	0,1
$SIXX(Pa)$	10	Non regression	7999,991	0,1

V2	11	Non regression	0,99	0,1
SIYY (*Pa*)	20	Non regression	8333,193	0,1
V3	22	Non regression	0,86689832	0,1
SIZZ (*Pa*)	25	Non regression	24072,934	0,1
V3	34	Non regression	0,97567	0,1
SIZZ (*Pa*)	40	Non regression	−533333,33	0,1

Table 3.4-1

4 Summary of the results

the got results check non regression code for the ENDO_ORTH_BETON model.